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BERMUDA

REPORT

OF THE

DEPARTMENT of AGRICULTURE

FOR THE YEAR

1949

11 JAN. 1951

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Board of Agriculture 1949

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C. VAIL ZUILL, Deputy Chairman

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Lt. Col. J. C. ASTWOOD, O.B.E., M.C.P.		The Hon. SIR HOWARD TROTT, C.B.E.

Department of Agriculture 1949

Civil Service List

Director of Agriculture: W. R. EVANS

Assistant Director of Agriculture: G. R. GROVES (w.e.f. 9th April, 1949)

Second Agricultural Assistant: C. V. E. EARLY (to 31st May, 1949)

Agricultural Assistant: C. V. S. Early (from 1st June, 1949)

Inspector of Produce: T. A. HOLLIS

Horticulturist: C. A. BAKER

Assistant Horticulturist: VACANT

Clerk, Board of Agriculture: MRS. MARGUERITE J. SPEED

Plant Pathologist: E. C. G. BEDFORD, B.Sc., M.Sc. (Pretoria)

Government Veterinary Officer: EDWARD R. EARL, D.V.S.

Not on Civil Service List

Marketing Officer: J. H. HOLLIS

Accountant: D. C. ELDRIDGE

Assistant Accountant: MISS AMY DeSILVA

Office Assistant: MRS. HELEN W. MORRISON

INDEX

	Page
BOARD OF AGRICULTURE	1
DEPARTMENT OF AGRICULTURE	1
AGRICULTURE 1949	3
AGRICULTURAL STATION	3
FRUIT CULTURE	3
REAFFORESTATION	4
RAINFALL AND WATER SUPPLY	4
ASSISTANCE TO FARMERS	4
GOVERNMENT HOUSE GROUNDS AND BERNARD PARK	4
PRODUCTION OF GROUND CROPS, ANIMAL PRODUCTS AND LIVESTOCK	5
CONTROL OF PLANT DISEASES AND PESTS	6
HEALTH OF ANIMALS	6
MARKETING OF PRODUCE	6
REPORT OF THE ASSISTANT DIRECTOR OF AGRICULTURE	7
REPORT OF THE PLANT PATHOLOGIST	11
REPORT OF THE GOVERNMENT VETERINARY OFFICER	21
SUMMARY OF RECEIPTS FOR THE YEAR 1949	25
EXPENDITURE FOR THE YEAR 1949	25
PROFIT AND LOSS STATEMENT FOR GOVERNMENT MARKETING CENTRE	26
ACKNOWLEDGMENT	27

REPORT OF THE DIRECTOR OF AGRICULTURE FOR THE YEAR 1949

The Chairman,
The Board of Agriculture.

I have the honour to submit herewith my report and those of my principal officers for the year 1949 in accordance with the provisions of the Agriculture Act 1930.

AGRICULTURE 1949

During the year under report farming in the Colony has taken a turn for the better. The incentive to farm was enhanced by the decision of the Board of Agriculture to adopt a scheme of "Planned Production and Marketing" which was subsequently approved by the Legislature and put into operation in the fall of the year.

A great majority of the farmers of the Colony have undertaken to support the scheme which should provide the necessary incentive for the gradual development during the next few years of the Agricultural industry which has fallen on evil days. The scheme has for its aim the control of plantings to fit the consumption requirements of the Colony and to stabilize prices at economic levels consistent with the cost of production and within the limits which the public can afford to pay for vitally necessary vegetables. At the time of writing the scheme is progressing satisfactorily but the crucial test will come during the early summer of 1950. If the scheme is to succeed there must be the closest co-operation between the farmers participating in it and the officials administrating the contracts.

AGRICULTURAL STATION

There have been marked changes for the better in the physical condition of the Agricultural Station during the year. The renovated administration building of the Department now presents a dignified appearance and a congenial place to work in. The new laboratory provides facilities and comfort necessary to perform entomological and pathological work in an efficient and orderly manner.

The Forestry and Exhibition Centre erected over the site which was once a Bull pen, though not yet completed, will serve many useful purposes in the years to come and an ugly landmark has disappeared and its place taken by a building of a more dignified appearance.

The new orchid house attributed largely to the efforts of the Horticulturist, has already been the subject of many favourable comments and within the next few years it should add greatly to the botanical aspect of the Agricultural Station.

Over 500 of the stately cedar trees that adorned the Agricultral Station, which had fallen victims of the Juniper scale **Carulaspis visci**, were removed but many of their places have been filled by scores of other trees and shrubs which when established will enhance the aesthetic beauty of the Agricultural Station.

Much clearing work and renovations were left undone during the year due largely to inadequate staff but the work will be continued with unabated vigour until the grounds of the Agricultural Station are cleared of undesirable features which have accumulated over recent years.

FRUIT CULTURE

The continued development of citrus culture was a most desirable feature of the Department's activities during the year. During the first six years the development of this particular aspect of the Colony's economy has been most gratifying. The credit for this most desirable feature is largely due to the leadership provided by Mr. H. St. George Butterfield, when six years ago he started a citrus growing campaign which culminated in the formation of the Bermuda Citrus Growers Association and subsequently a co-operative working arrangement between the Association and the Department of Agriculture.

That citrus fruits can be grown successfully in Bermuda is no longer a moot point but there is a need for better understanding of the fundamental principles of citrus culture and a practical experience of the many chores which must be performed faithfully and thoroughly at regular intervals during the year.

Avocado Pear culture gained a few more adherants during the year but Avocado Pear cultivation has not caught on with the force and determination as has Citrus Culture. The possibilities of Avocado Pear cultivation being a success are most encouraging as many of the trees planted during the last three to four years have this year demonstrated convincingly their fruiting habits. Given the same care and attention that is now being given to Citrus, Avocado Pear growing should be highly successful and efforts should be made next year to place Avocado Pear growing on a regulated co-operative programme similar to that now in force in respect to citrus.

REAFFORESTATION

Confronted with the possibility of losing the native cedar **Juniperus bermudiana** through the depredation of scale insects, reafforestation became number one project in the Department's activities early in the new year. Mr. T. A. Hollis, Inspector of Produce, was seconded for Reafforestation duties on 15th March, 1949, and immediate steps were taken under Mr. Hollis' supervision to organize a land clearing unit. During the month of March, 1949, Mr. Hollis visited Gloucester, Virginia, U. S. A., to receive instruction in the operation of a mechanical winch which has been purchased from the Al Evans Winches Inc., Gloucester, Virginia. On Mr. Hollis' return to the Colony on 14th March, he went to work organising a tree clearing unit and by the end of the year 8,000 trees had been uprooted Originally it was intended only to clear Colonial Government lands but owing to urgent requests from private individuals to have their lands cleared for replanting it was decided to undertake private work and at the year's end there was a substantial waiting list of applicants.

The land clearing unit has grown consistently concurrent with the demand of the public for service and by the end of the year it had reached a stage where it was straining the manpower of the Department of Agriculture and the limited facilities of the Agricultural Station. The land clearing unit is but one aspect of the reafforestation programme of the Colony and it does not, from an agricultural and horticultural point of view, fit in with the training of Agricultural and Horticultural Officers. The Board of Agriculture shouldered the responsibility when there was need for action and no other Department of Government was willing to assume the responsibility. I think the time is ripe to revise the order of things which will permit the Department of Agriculture to concentrate its efforts towards the production of plants and their establishment. That alone is a tremendous undertaking which will tax the efforts of the Department for years to come.

RAINFALL AND WATER SUPPLY

The rainfall recorded at the Agricultural Station during the year was 46.68 inches which was the lowest on record and was 11.15 inches short of the average for the preceeding four years.

The water supply of the Agricultural Station is a matter of great concern because the increasing activities of the Department in connection with reafforestation work has added new water problems to those which already existed. The new Forestry Centre when completed will furnish substantial additional water catchment and it is hoped that during 1950 additional facilities will be provided.

ASSISTANCE TO FARMERS

The Department sprayers and tractors were engaged in services for farmers and others during the year for which a nominal fee was charged.

The spraying equipment performed a total of 1,373 working hours as follows:—

On Farm Crops	803 hours
On Citrus Crops	512 „
On Horticultural Crops	58 „

Tractor services were in good demand but owing to frequent breakdowns and delays in securing repair parts from abroad it was only possible to cultivate 200 acres of land.

GOVERNMENT HOUSE GROUNDS AND BERNARD PARK

Under the supervision of the Agricultural Assistant these grounds have been maintained in a satisfactory condition.

The loss of a large number of cedar trees in the Government House grounds due to the depredations of the Juniper scale **Carulaspis visci**, has posed a problem of wind exposure and landscaping deficiencies which will become increasingly apparent in the immediate future. These will receive attention in 1950 but several years will have elapsed before the surroundings can be transformed to conform with the standards they should attain.

A great deal of effort has been made to improve the aesthetic beauty of Bernard Park but our endeavours have been thwarted by acts of vandalism by irresponsible people who have wantonly destroyed new plantings of trees and shrubs and causing irreparable injury to matured plantings of ornamental plants and shade trees.

PRODUCTION OF GROUND CROPS AND ANIMAL PRODUCTS AND LIVESTOCK POPULATION

Below are given statistics of the estimated production of agricultural products:—

A.

Commodity	*Area under crop exp. in acres*	*Average yield per acres in lbs*	*Total yield in lbs*	*Unit Value*	*Farm Value*
Beans	50	4,000	200,000	1/3d.	£12,500
Beets	25	8,000	200,000	5d.	4,166
Broccoli	20	2,500	50,000	1/4d.	3,333
Cabbage	40	13,000	520,000	6d.	13,000
Carrots	55	11,000	605,000	7d.	17,645
Onions	20	10,000	200,000	8d.	6,666
Potatoes (Irish)	280	8,500	2,380,000	5d.	49,583
Potatoes (Sweet)	15	9.000	135,000	5d.	2,811
Tomatoes	50	12,000	600,000	1/-	30,000
Misc.	35	8,000	280,000	6d.	7,000
Bananas	80	10,000	800,000	8d.	26,666
	670		5,970,000		£173,370

B. CITRUS

Area under cultivation in acres	*No. of trees*	*Average yield per tree in dozens*	*yield in dozens Total*	*Unit Value*	*Farm Value*
64	8,950	2½	22,375	4/6d	£5,000

C. LILY BULBS AND FLOWERS

Area under cultivation in acres	*No. of bulbs planted*	*No. of bulbs exported*	*Value*	*No. of flower buds exported*	*Value*
25	1,200,000	239,600	£7,200	2,800,000	£10,500

No. of flower stems exported	*Value*	*Total value of all lily products*
36,000	£7,500	£25,200

D. MILK

Total production expressed in gallons	*Value*
624,150	£145,635

E. MEAT PRODUCTS:

Beef in lbs.	*Value*	*Veal in lbs.*	*Value*	*Pork in lbs.*	*Value*	*Poultry in lbs.*	*Value*
68,800	£3,400	64,300	£3,200	366,000	£22,800	40,000	£3,000

F. EGGS:

Expressed in dozens	*Value*
300,000	£90,000

LIVESTOCK POPULATION

A. DAIRY ANIMALS:

Cows	*Heifers*	*Bulls*	*Total*
1,140	105	30	1,275

B. HORSES:

Farm and Truck	*Carriage*	*Race Horses*	*Total*
150	100	60	310

C. PIGS:

Sows	*Boars*	*Store Pigs*	*Piglets*	*Total*
280	60	1,700	400	2,440

D. GOATS:

Adults	*Kids*	*Total*
300	200	500

E. POULTRY:

Adult Fowls	*Chicks*	*Total*
30,000	18,000	48,000

NOTE: The following volume of vegetables was exported during the year: British West Indies 914 bushels, (mostly cabbage), having a farm value of £508.

CONTROL OF PLANT DISEASES AND PESTS

A tremendous effort was made during the year to obtain control of the scale insects attacking the native Cedar **Juniper bermudiana.** By the end of 1948 surveys indicated that the Juniper scale **Carulaspis visci** was attacking the cedars in every part of the Island but the infestation was relatively low in Southampton and Sandys Parish. The introduced ladybird beetle **Lindorus lophanthae** (Blaised) was fairly prevalent on all living cedars during the spring months and by all appearances the scale infestation was disappearing and new healthy growth was showing up generally in most of the wooded areas left. This favourable situation lasted but a short time and it was plainly evident by the end of the summer that the infestation was again gaining momentum and by the end of the year the trees were showing signs of accelerated deterioration.

At the year's end Dr. W. R. Thompson, Director of the Commonwealth Bureau of Biological Control, visited the Colony to survey the scale situation and after a careful study of all the factors the Board of Agriculture decided to intensify the campaign to bring **Carulaspis visci** under control and the Legislature voted the necessary funds to intensify the mass breeding of predators and to explore new areas for additional material to fight the infestation.

Details of the campaign to control **Carulaspis visci** will be found in the Plant Pathologist's Report.

HEALTH OF ANIMALS

It is gratifying to note that only one case of Tuberculosis was found in the cattle tested by the Government Veterinary Officer during the year, a record which reflects the wisdom of frequent and thorough testing.

It is with regret that I refer to the dwindling interest in animal husbandry in the Colony which in the main is due to the increasing cost of imported feedstuffs. During the first half of the year tendency was for lower imported feed prices but after the devaluation of the Pound sterling, there was a sharp raise and by the year's end prices of commercial feeds were two and a half times greater than in 1938.

Details of the campaign to control **Carulaspis visci** will be found in the the Government Veterinary Officer's Report.

MARKETING OF PRODUCE

As indicated previously, Planned Production and Marketing was commenced in the fall of the year and the Government Marketing Centre under the supervision of Mr. James H. Hollis was being geared up in anticipation of the increased volume of produce that would pass through the Centre.

Sales of produce through the Marketing Centre increased by approximately £3,000 compared with 1948 but the receipts from the Cold Storage Plant were down by approximately £300 compared with the previous year.

The following volume of business was transacted during the year:—

VOLUME OF BUSINESS RECORDED AT GOVERNMENT MARKETING CENTRE DURING 1949

Month	*Purchases*	*Sales*	*Cold Storage*
January	£1,577 0 8	£ 804 2 5	£23 9 0
February	1,147 12 5	1,340 8 2	17 1 9
March	1,010 5 5	1,483 10 5	41 5 9
April	1,968 2 8	1,264 3 3	18 14 4
May	2,296 11 8	1,243 11 5	31 2 6
June	1,520 18 6	1,518 10 0	29 18 0
July	860 9 3	3,217 14 2	168 15 0
August	428 8 10	560 15 4	56 13 6
September	223 11 4	251 4 0	74 19 9
October	652 16 0	708 19 5	57 18 6
November	765 19 5	719 17 6	34 0 0
December	1,884 15 4	1,505 15 0	47 1 0
	£14,337 11 6	£14,618 11 1	£600 19 1

REPORT OF THE ASSISTANT DIRECTOR OF AGRICULTURE

The Director of Agriculture:

I have the honour to submit the following report of my work from the date of my arrival in the Colony to the end of the year 1949.

REAFFORESTATION

Throughout the period under review I was largely concerned with the problems of reafforestation. In some respects the term reafforestation may appear somewhat ambiguous, since it is not ordinary forestry work necessitating the raising and planting of a few species of trees in comparatively large numbers and large areas. The problem is far deeper than this. Development in Bermuda has taken place within a forest, in fact it is difficult to find a similar development of trees standing so close together in the immediate vicinity of the towns and dwellings anywhere else. The local cedar tree **Juniperus bermudiana** has on every site formed the background of the Bermudian landscape. Admittedly with so many cedar trees (an average of approximately 300 trees per acre) the effect may have been termed dull, nevertheless, the cedar provided good light shade and grass grows freely underneath the trees. It is well adapted to the shallow soils, withstands the wind in exposed positions, acting as an excellent windbreak for the more tender subjects such as fruit and vegetables, and gives each dwelling the desired amount of privacy without many additional plantings. To find a tree or trees to replace the local cedar possessing so many admirable qualities is no small undertaking. In fact, it is extremely doubtful whether any other plant will succeed on some of the very exposed hillsides.

The immediate problem which has to be faced is the planting of the sites where the trees have died. Reafforestation work in Bermuda is therefore landscape gardening in its truest sense. Despite the fact that the whole of Bermuda was well wooded with the native Juniper, thanks to the efforts of plant lovers, over a period of many years a large and varied assortment of plants introduced from all but the arctic regions of the world have become so well established here that many of them may now be regarded as Bermudian.

From these well known trees, shrubs and palms have been selected subjects to replace the local Juniper. It is very obvious that the general appearance of Bermuda must change considerably in the years ahead and the vegetation will become much more varied than in the past. Although other subjects must be used freely, **Juniperus bermudiana** is not being abandoned entirely. On the contrary, every effort is being made to perpetuate the species. Some sixty pounds of cedar berries were sown at the Agricultural Station during the autumn of 1949 and all seedling trees are being preserved. In addition to the local propagation of the species 40 lbs. of berries were sent to the Bahamas and Jamaica. It is hoped that the species will become established in both of these Colonies.

In addition to the removal of the dead trees, the reafforestation work was divided into two main phases:—

1. Propagation and importation of suitable plants.
2. Landscaping.

1. PROPAGATION AND IMPORTATION OF SUITABLE PLANTS. It was essential to considerably enlarge the nurseries at the Agricultural Station to cope with the ever increasing demand for plants. At the time of reporting it is estimated that the nursery contains a stock of 25,000 plants in tins. Certain limitations, namely, the water supply will prevent the further expansion of the nurseries to any great extent. To maintain plants in tins and other receptacles, a large reserve of water is required. The existing water storage capacity at the Agricultural Station is not considered sufficient to safely expand the nursery beyond a holding capacity of 30,000 plants. Cuttings of Hibiscus and similar plants which are easily transplanted with bare roots are being raised in the open nursery. This method it is hoped will enable a slight further expansion without drawing on the water reserves too heavily.

To augment local supplies a considerable number of plants were imported from Florida, U.S.A., Belgium, England, Jamaica and Trinidad. During the year the Director of Agriculture visited Trinidad, Jamaica and Florida and the Horticulturist joined the expedition to the Caicos Islands and Jamaica. As a result of these contacts the Department of Agriculture in Trinidad and Jamaica were especially helpful in supplying plants suitable for growing here. In addition to the plants, 5,000 seed coconuts, **Cocos nucifera** were obtained from Jamaica. These are germinating very well. There is a keen demand for coconuts since this is a valuable plant for planting near the seashore.

2. LANDSCAPING. Wherever possible, the areas where the clearing operations were completed quick growing trees and shrubs were planted immediately. The Government Properties in Hamilton and district received special attention. In addition to this the Parish Arbor Societies were given every encouragement to

carry out roadside planting schemes. Some parishes have responded exceptionally well. For this particular work plants were supplied free of charge. The major planting scheme of the year under the supervision of the writer of this report was the scheme carried out with the permission of the Officer Commanding British Troops in Bermuda on War Department land at Horseshoe Bay, Southampton. In this area some 400 "coconuts" **Cocos nucifera,** 300 "Bay Grapes" **Coccoloba uvifera,** 50 "Whistling Pine" **Causuarina equisetifolia,** and 2,000 "Oleander" **Nerium oleander** were planted. The work was performed by voluntary workers from the Chamber of Commerce and the Warwick, Southampton and Sandys Arbor Societies.

ADVISORY SERVICE

Citrus Cultivation. During July and August, a tour was made of the Citrus Orchards with members of the Citrus Growers Association Executive Committee, 70 orchards were visited. This tour gave the writer the opportunity to become acquainted with the growers and gain first hand information on the general condition of the trees. Generally speaking the crop was light due to the effects of the 1948 hurricanes but despite this severe setback, the citrus trees are in good condition. The evidence of pest and disease was small. This indicates that the spraying and fertilizing service of the Department of Agriculture through the medium of the Citrus Growers Association is working well. Certain diseases such as Melanose and Sour Orange Scab are causing concern in some orchards but a slightly modified spraying program should control these diseases. Mites were also troublesome in some orchards. These were particularly noticeable on lemons and limes.

Some growers were concerned whose trees were showing signs of nutritional disease. This trouble was observed in many parts of the Colony. So far it has not been possible to determine the element or elements which the trees are lacking. However, it is hoped that a leading authority in citrus culture from Florida will visit Bermuda in 1950 when it will be possible to discuss these nutritional problems.

The cultivation of citrus is one of the best schemes undertaken by the Department in recent years and every encouragement will be given to foster further development of citrus culture. The Fifth Annual Exhibition of the Citrus Growers Association held at the Department of Agriculture's Marketing Centre in Hamilton on the 14th, 15th and 16th December fully demonstrated the keen interest that is being shown by the general public in citrus culture. This is also borne out by the increasing demand for young trees.

Advisory Visits. Throughout the period covered by this report 144 advisory visits were made in addition to the 70 visits mentioned in the previous paragraph. This necessitated travelling to all parts of the Islands. Many of the enquiries were in connection with the death of the cedar trees and advice on general landscape gardening. This is a service which the public appears to be taking full advantage.

Lectures. Lectures were given to the following organizations: The Bermuda Garden Club, Southampton Arbor Society, Sandys Arbor Society, West End Parent Teachers Association and to a meeting of the School Teachers arranged by the Bermuda Garden Club.

Broadcasts. The following Departmental broadcasts over Z.B.M. were undertaken:

11th May.	Reafforestation work, with the Chairman of the Reafforestation Committee and the Director of Agriculture.
22nd June.	The Pembroke Arbor Society work with members of the Society.
11th Aug.	History of the Department of Agriculture celebrating 51 years of service to the Colony.
28th Sept.	Plant Resources of British Guiana.
12th Oct.	Sandys Arbor Society work with members of the Society.

School Gardens. It is encouraging to find that eight of the schools in Bermuda are taking an active part in teaching gardening. The school garden competition arranged annually by the Bermuda Garden Club, undoubtedly helps very materially to maintain the interest. Some of the schools have improved the appearance of the school grounds by including the cultivation of flowers in addition to vegetables. The planting of trees and shrubs has also been undertaken in certain cases but much more could be done to improve the school properties. It cannot be too strongly emphasised that to make the whole community plant conscious, the school grounds throughout the whole Colony must be tastefully landscaped. Admittedly many of the sites are on hard rock, but even these can be converted into attractive grounds by the judicious planting of trees and shrubs in well prepared situations, the planning of proper drives and the formation of lawns.

Flower Shows. An educational exhibit was staged at the Smith's and Hamilton Parishes Fair held on the 21st April, the Sandys Flower Show on the 5th May and at the meeting of the Southampton Arbor Society on the 10th May. This exhibit was staged to demonstrate methods of biological control of the cedar scale and the kinds of plants suitable for planting in the place of the dead cedars. Much interest was displayed in the exhibit at each centre.

THE AGRICULTURAL STATION

Major Improvements. The new Departmental Offices and the Laboratory on the site of the old offices were completed in July. The staff moved into the new building on the 21st July. The opportunity was taken to completely re-landscape the area around the new building. During this operation the old Carpenters' Barn and the Bicycle Shed were demolished. In the centre of the site of the old barn is now growing a specimen of **Ficus nitida.** Other improvements include the erection of the Forestry Centre and Horticulturist's office on the site of the old bull pen, the planting of 32 varieties of Oleander, **Nerium Oleander** on the slope immediately west of Montrose Cottage and the remodelling of the Rock Garden. Further plantings of trees and shrubs were made in the areas where the dead cedars have ben removed.

As a result of these improvements and the removal of 1,000 cedar trees the appearance of the Agricultural Station has changed considerably. Further improvements are contemplated for 1950 but the year 1949 will go down in history as the beginning of the new Agricultural Station.

EXPERIMENTAL PLOTS

(a) **Trial of Potato Varieties.** An interesting trial of 16 varieties of potato was conducted. The table below indicates the resistance to Blight disease and the yield in lbs. per rod.

No.	*Variety*	*Date Planted*	*Misses*	*Leaf-roll*	*Mosiac*	*Resistance to Blight*	*Yield per rod*
1.	Irish Cobblers	16.2.49	2	2	-	Moderate	88½ lbs
2.	Arran Victory		2	-	-	High	88 „
3.	Canus		7	-	-	Low	88 „
4.	Chippewa		15	-	-	Low	64 „
5.	Bliss Triumph		1	-	-	High	112 „
6.	Clarks No. 3		5	-	-	Moderate	92 „
7.	Early Rose		2	1	-	Moderate	72 „
8.	Green Mountain		1	-	-	Moderate	80 „
9.	Pawnee		9	-	-	Very low	32 „
10.	Sebago		5	-	-	High	80 „
11.	Sequia		15	-	-	High	81 „
12.	Up-to-Date		10	1	-	High	72 „
13.	Warba		2	-	-	Very low	64 „
14.	Chili Garnet		2	-	-	High	91 „
15.	Seedling F. 391		-	-	-	Very high	90 „
16.	Seedling F. 431		-	-	-	Very high	84 „

(b) **Fertilizer Experiments.** Carrots, onions, and ruta baga were grown for the purpose of testing the value of the following fertilizers: 4:12:6, Castor Pomace, and Sulphate of Ammonia and Superphosphate. The results, however, were not sufficiently outstanding to do more than mention the experiment.

(c) **Long Term Manurial Experiment.** The most interesting experiment to be undertaken during recent years is the experiment to be carried out over a period of five years which was started with the 1949 autumn planting. The three southern plots are being used for this experiment. Each plot is to be planted over the period of five years with identical crops, but the manuring of each plot will be: West plot, 4:12:6 only, applied to growing crops. Centre Plot, farmyard manure ploughed in before planting, and the East Plot, Castor Pomace only, applied to growing crops. In conjunction with this cropping a detailed account of all costs incurred in producing the crops and the crop returns are being kept.

Fruit Culture. Citrus trees in the Old Orchard produced a fairly heavy crop of fruit but very few fruits were obtained from the trees in the Victory Orchard with the exception of limes and lemons. This was entirely due to the effects of the 1948 hurricanes. Despite the hurricane damage the trees are now in reasonably good condition. Mites were troublesome on limes and lemons. The trees were sprayed with DN 111 in July but this did not prevent the discolouration of the fruits. It is thought, however, that if the DN 111 had been applied a month earlier, the discolouration of the fruits would not have taken place.

Easter Lily Varieties. A collection of varieties of Easter Lilies was obtained for the autumn planting. Many of the seedlings planted were raised by Mr. Howard E. D. Smith, O.B.E. of St. David's and varieties from other sources were also planted in the Montrose Field. The object of these plantings is twofold. Firstly, to enhance the Agricultural Station for the benefit of the tourists and secondly, to perpetuate the valuable hibridization work which has been done by Mr. Howard Smith.

Sale of Fruit Trees. During the year 1949, 3,164 citrus trees and 230 avocado pear trees were imported from Florida and sold to the general public at prices below cost.

Sale of and Distribution of Ornamental Plants. Including the trees, shrubs and palms used in various planting schemes undertaken by the Department of Agriculture, plants donated to Arbor Societies and other public bodies and ornamental plants sold to private individuals the total number of plants sent out from the nurseries during 1949 amounted to 11,808.

Visitors. The Agricultural Station was visited by a large number of people, many of whom expressed keen interest in the improvements being made and in the considerably enlarged collection of ornamental plants.

EXTENSION WORK

Nonsuch Training School, Experimental Farm. Extension work included the establishment of a citrus orchard containing 55 trees, a small plant nursery, a vegetable garden and a small livestock unit of pigs and goats at the Nonsuch Training School on Paget Island. The object in view is to teach the boys of the school the elementary principles of practical agriculture and horticulture. Paget Island is admirably suited for such a project. The scheme could not have been put into practice but for the enthusiasm shown by the Superintendent of the School, Mr. Arthur St. George Tucker. It is anticipated that this scheme will help to train the boys into useful gardeners and some will in due course, find employment as trained gardeners when they leave the school. Regular monthly visits were made to the Centre by the writer and on each occasion a short talk was given the boys on various aspects of fruit culture and nursery work. Although this is a new venture the results so far are very encouraging.

NOTES ON THE BANANA

The severity of the "Black Tip" of the Banana in many parts of the Islands resulted in the careful examination of bunches in six plantations. Although "Black Tip" has been attributed to a fungus disease **Helminthosporium torulosum,** the writer found the larvae of a small moth present in all the affected bananas, which suggests that the fungus may be a secondary cause only of the malady. This moth has now been identified by the Commonwealth Institute of Entomology as **Fundella** sp. ? **pellucens.** The trouble appears to be very prevalent from July to September. From October onwards the bunches which are then produced are entirely free from the "Black Tip." During 1950 tests will be made with certain insecticides with the object of destroying the larvae of the moth before it eats its way into the fruit.

Another "disease" of the Banana which has been observed in the Spanish Point and Bailey's Bay area is one in which the leaves turn a bronzy brown colour, giving the impression that the leaves have been scorched. The plants so affected produce a very small bunch of inferior fruits and suckers are very slow in developing. Apparently this condition of bananas has been observed in Bermuda for the last three or four years but at the time of reporting, the cause of this condition has not been determined.

OFFICE WORK

The office work included correspondence on various subjects and the writing of monthly reports.

A bulletin on "Plants Recommended for Reafforestation Purposes" was published in June. Work was commenced on the preparation of an "Annotated List of Useful and Ornamental Plants" in Bermuda. It is hoped to spend more time on this work during 1950, but publication may not be possible until 1951.

PLANT INTRODUCTIONS

Amongst the recent introduction of plants new to Bermuda may be mentioned:—

Pinus Thunbergii; Ficus benjamina; Pinus caribaea; Pinus palustris; Barringtonia speciosa; Cryptomeria japonica; Juniperus virginiana; Cupressus macrocarpus; Callitris cupressiformis; Thuya Chamaecyparis; Juniperus horizontalis tamariscifiora; Juniperus horizontalis Bar Harbor; Lagerstroemia flos-reginae; a collection of 25 Cattleya hybrids and a collection of 30 named varieties of Hibiscus.

PERSONAL ACTIVITIES

I acted as Director of Agriculture during the periods 3rd to 11th June and 30th September to 6th November inclusive.

Respectfully submitted,

GORDON R. GROVES.

Assistant Director of Agriculture.

REPORT OF THE PLANT PATHOLOGIST

To the Director of Agriculture:

I have the honour to submit a report on work done on plant diseases and pests during the year 1949.

GENERAL REVIEW

Work done during the year was concentrated as much as possible on the biological control of the Juniper scale, **Carulaspis visci** (Schrank) previously recorded as **Diaspis visci** an introduced pest on the Bermuda cedar tree, **Juniperus bermudiana** L.

By the end of 1948, surveys showed that the scale was already present on every cedar tree in Bermuda, although the infestation was sometimes very light.

Healthy trees and trees which had previously been weakened by scale or which had been partly defoliated by the September 1948 hurricane produced a flush of new growth during the spring. At the same time, the introduced ladybird beetle, **Lindorus lophanthae** (Blaisd.) was common almost everywhere and the prospects of the scale being controlled by the predator were very promising. The hot and relatively dry summer, however, caused thousands of trees which were weakened by scale and hurricane damage to die and was accompanied by a continued steady increase of the scale in many of the remaining areas of healthy trees throughout the Island. The scale continued to defoliate and kill trees, although the infestations were not as heavy as in previous years.

By the end of 1949 Bermuda's cedars were in an extremely sorry state. In the centre and in the eastern end of the Island the greater portion of the trees are dead, while the remaining trees are mostly sickly or have started to decline. In the western end of the Island the trees are in a relatively much better condition, but deterioration is increasing in every area of trees and considerable defoliation can be expected during 1950.

MAJOR PROBLEMS INVESTIGATED

Carulaspis visci on Cedars

I. CARULASPIS VISCI AND THE CONDITION OF THE CEDAR TREES: During the first half of 1949, difficulty was experienced in finding heavy infestations of healthy carulaspis scales suitable for the liberation of predators.

At the end of May there was a fairly general flush of healthy new growth on many cedars throughout the Island. Trees in some parts of the central parishes had crops of berries. Conditions looked very promising.

Surveys which were made during November and December revealed that the trees in many areas which had previously been in good or fairly good condition had deteriorated during the latter half of 1949. In some cases this seemed to be due to the accumulative after-effects of a medium infestation of scale as at "Lang House," St. David's. **Lindorus** was abundant at "Lang House" in May and appeared to be controlling the scale, having reduced the infestation to a light one. The scale infestation did not seem to be any worse in November, but the trees had lost their original healthy green colour and the foliage felt slightly dry to the touch, which is an indication that the tree is beginning to decline.

The accumulative after-effects of a medium infestation of **Carulaspis visci** probably cause a relatively slow but progressive deterioration of the tree which is rather different to the very rapid defoliation of the cedar tree caused by a quick build up of the scale population culminating in a very heavy infestation. The latter condition was typical from 1945 to 1948.

Towards the end of 1949 there commenced a general deterioration of many of the remaining areas of healthy trees as well as areas of sickly trees which had been partly defoliated and weakened by scale and hurricane damage. The worsening condition of the latter areas was probably accelerated as a result of the rainfall deficit for 1949 or nine and three quarter inches. A deficit of this amount occurs about once in ten years. With the exception of November, all months from July to December had a deficit of rainfall.

Thousands of trees which were severely injured by salt spray blown by the hurricane of September 13th, 1948, died during 1949. Many which had produced vigorous new growth during the spring finally wilted and died during the latter half of the year, leaving the exposed southern slopes of the hills in all parishes from Warwick to St. George's covered by a continuous grey expanse of hundreds of thousands of dead trees. But there still remain isolated stands of green trees on the sheltered slopes facing north, which stand out very strikingly among this area of dead trees. The present condition of the trees in this area is undoubtedly far worse than it would have been as a result of either the **Carulaspis visci** scale or the September 1948 hurricane alone.

Large stands of relatively healthy cedar trees still remain in Sandys and Southampton parishes where defoliated areas are still small in extent. Further efforts to save Bermuda's endemic cedar tree by biological control of the **Carulaspis visci** will be concentrated in these areas. The task is a difficult one and the prospects none too bright.

The Bermuda cedar is obviously very susceptible to injury by **Carulaspis visci.** The possibility has now arisen that the tree may not be able to withstand the accumulative effects of even a light annual infestation of scale. Although trees near the original centre of infestation have survived the scale for several years, many are gradually dying. As a last resort, attempts to establish additional predators are being continued and intensified in the hope that the **Carulaspis** infestation can be reduced to a sufficiently low level to allow the remaining healthy cedar trees to survive.

2. **LINDORUS LOPHANTHAE:** This coccinellid was first introduced early in 1947 and liberations were continued until November 1948. One further liberation was made in June 1949. **Lindorus** became established very quickly and its increase and spread was remarkably rapid. By the end of 1948, **Lindorus** was well distributed throughout the Islands, adults and larvae of all sizes being easily found on practically every scale-infested tree, in every stand of trees. It was still occasionally absent, however, on individual branches which were heavily infested with **Carulaspis,** or on branches on which there were very few scales.

Throughout 1949, the predator was again found in every area which was surveyed, but it never became abundant enough to halt the general increase of the scale during the summer months. Areas were **Carulaspis** appeared to be controlled by **Lindorus** were found in Sandys, Southampton and Warwick parishes. But in adjoining areas the scale infestation was heavy or building up and there was little evidence of feeding by the predator.

By the end of May it appeared as if **Lindorus** was beginning to control the scale. The predator was present everywhere. It was frequently found on every branch which was inspected, except on branches which were relatively free of scale. It was often present where the host density was very low. Beetles and often larvae of **Lindorus** could often be seen simply by glancing over the foliage It was no longer possible to locate any infestations of **Carulaspis** without finding at least a few scales eaten by **Lindorus.** The percentage of scales eaten by the predator still varied considerably, however, which showed that there was not yet a uniform population of the beetle in proportion to the amount of scale.

A count of the larvae and adults of **Lindorus** which could be beaten from the branches of cedar trees was made on May 10th at "Lang House," on St. David's Island. One branch on each of ten trees selected at random was beaten over a white cloth (3 ft. x 4½ ft.). The number of **Lindorus** found on each branch was as follows:—

Tree No.	*Larvae*	*Adults*
1	5	35
2	21	47
3	32	21
4	20	32
5	17	36
6	17	52
7	28	32
8	7	41
9	29	32
10	65	8
Total	241	336

According to the above figures there was an average of 24 larvae and 34 adults of **Lindorus** on every branch. The infestation of **Carulaspis** at "Lang House" was generally light. **Lindorus** appeared to have the scale under control, and both the scale infestation and the numbers of **Lindorus** seemed to have decreased since the beginning of the year.

Sample of cedar foliage which were fairly heavily infected with **Carulaspis visci** were collected at the entrance to "Wreck House," Sandys Parish, on May 6th. Out of a total of 485 **Carulaspis** scales of all sizes which were examined, only 5 per cent were alive while 95 per cent had been eaten by **Lindorus.** Only a few additional scales had died due to unknown causes. No larvae or pupae of the parasite were found. There were ten scales which showed evidence of parasitism, but all had been nibbled by **Lindorus.** A similar high percentage of control of **Carulaspis** by **Lindorus** had probably been reached in other areas on the Island, but areas still remained where the predator had only begun to influence the scale population which was steadily increasing .

During July, healthy **Carulaspis** scale was sometimes found on the tips of the last flush of new foliage. This probably represented the summer breed-up of scale. Scale on the older growth was sometimes well eaten by **Lindorus,** but the predator seemed backward in attacking the scale on the new growth. Although the beetle was still active in the field, the hot summer temperature may have been more favourable to scale increase that to the increase of the predator.

A general survey of **Lindorus** was made on December 5th and 6th. A total of 108 cedar trees, taken at random from 27 different stands of trees located at intervals along the main roads from "Cambridge Beaches," Somerset, to the town of St. George's, were inspected for **Lindorus** by beating one branch on each tree

over a white sheet. The numbers of **Lindorus** were counted and amounted to 81 adults and 442 larvae, or an average of 0.8 adults and 4.1 larvae per tree. Ten pupae were also counted.

Lindorus was found in 18 out of the 27 sites. Had more than four samples been taken in each stand of trees, **Lindorus** would probably have been found in every stand. It is of interest to note that **Lindorus** was found in every stand of trees from "Cambridge Beaches," Somerset to a point west of "The Dunes," Paget and in St. George's parish from Ferry Point to the town. A total of 79 adults and 439 larvae were found on the 60 trees. **Lindorus** is obviously quite common in this area. In the central parishes from "The Dunes," Paget to Tom Moore's Tavern, Hamilton Parish, the beetle was found in three out of twelve sites, while only 2 adults and 3 larvae were found on the 48 trees. The foliage of 26 out of the 45 trees without **Lindorus** was, however, very lightly infected with **Carulaspis visci.**

The results of the above survey agree with observations made in the field during 1949. Both **Carulaspis** and **Lindorus** were more abundant in the western and eastern ends of the Island than in the central parishes.

The degree of control exercised by **Lindorus** up to the end of 1949 has been disappointing, especially as the beetle was breeding up so rapidly in the spring. Although scales which have been eaten by the beetle can be found on practically every tree in the Island, there are still groups of trees and individual trees where the **Carulaspis** infestation is very heavy with little evidence of feeding by **Lindorus.** In Sandys and Southampton Parishes, which were more recently infested with scale than the rest of the Island, new infestations of very healthy scale are building up on scattered groups of trees in areas where most of the cedars are still relatively healthy.

Lindorus has at least checked **Carulaspis** to a certain extent. In many areas the scale has been largely eaten by the beetle, and in some cases it actually appears to have controlled the scale and reduced the infestation.

It now seems evident that **Lindorus** is only capable of partial control of **Carulaspis visci** and that additional controlling factors are necessary if Bermuda's cedars are to be saved from complete extinction.

3. **FIELD SURVEYS OF CARULASPIS AND LINDORUS.** Cedar trees in every part of the Island were inspected during the year, but surveys were concentrated mainly in Sandys and Southampton Parishes because the bulk of the remaining healthy trees were confined to the west end of the Island. A field assistant carried out most surveys from May onwards, and about half of the wooded areas in these two Parishes had been inspected by the end of the year. The main purpose of the surveys was to locate trees with heavy infestations of healthy **Carulaspis** scale suitable for the liberation of predators.

Two aerial surveys of the whole of Bermuda were made during the year. The eastern half of the Island presents a dismal sight from the air.

4. **TESTING OF NEW PREDATORS ON CARULASPIS VISCI.** (a) **Laboratory Tests:** Six new species of predators which were received from California during the year were confined on cedar foliage which was heavily infested with **Carulaspis visci.** The adults of each species fed readily on **Carulaspis** and many were still alive after several weeks during which they oviposited very satisfactorily according to the number of larvae which were obtained. The larvae of all six species thrived well on the Juniper scale.

Microweisia, Telsimia, Lotis nigerrima, Lotis neglecta, Pharoscymnus exiguus and **Cephaloscymnus occidentalis** were all reared successfully from the egg to the adult stage in the laboratory. The life cycle of most of these species was about eight weeks in a heated room, except **Telsimia** and **Microweisia,** which developed quicker than the others.

(b) **Field Tests in Bags:** Larvae of **Telsimia, Lotis neglecta, Pharoscymnus** and **Cephaloscymnus** were recovered from cedar branches on which adult beetles had been confined in cloth bags a few weeks previously.

5. **PREDATORS FROM CALIFORNIA:** During 1949, a total of 340 shipment boxes which contained 329,414 beetles was received from Mr. Wendell Sellers, Senior Entomologist Commonwealth Bureau of Biological Control. The predators were reared at the Fontana Laboratory, Fontana, California. In most cases the beetles arrived in excellent condition three or four days after leaving California by air for Bermuda. Up to the middle of July the live beetles were all counted as they were removed from the shipment boxes. In later shipment boxes the number stated on the box was recorded as the number liberated, unless the mortality was higher than usual when the dead beetles were counted. The average mortality was probably about 3 per cent.

The predators from California were distributed as follows:—

Liberated on cedar trees	317,557
Liberated on scale on oleanders and palmettoes	3,519
Retained for mass rearing	8,338
TOTAL:	329,414

6. **PREDATORS REARED IN BERMUDA:** In January, potatoes were infested with the Bermuda Oleander scale or West Indian Peach scale, **Aulacaspis pentagona** Targ., by placing infested branches over the potatoes. After preliminary tests showed that this scale would be suitable for feeding some of the introduced predators, mass rearing of the beetles was commenced in August.

The total number of predators produced in Bermuda from August to December 1949 amounted to 161,633. These were distributed as follows:

Liberated on cedar trees	135,949
Liberated on scale on oleanders and palmettoes	1,586
Retained for mass rearing	24,098
TOTAL	161,633

7. **LIBERATION OF PREDATORS AGAINST CARULASPIS VISCI:** The total number of predators liberated on cedar trees against **Carulaspis visci** from January 1st to December 31st 1949, was 453,506. The liberations entailed 143 trips by car. Table I gives the monthly liberations of predators during 1949. In 1948 only 9,091 predators were liberated, from April 12th to December 31st.

The weather, following the liberation of 4,133 beetles in January and February was not very favourable. The month of March was windy for the first three weeks. Gales were recorded on 14 days (the maximum number recorded in March since 1932). There was a gale with gusts up to 60 m.p.h. at the beginning of the month.

A summary of the numbers of each species of predator liberated in each parish from May 1st to December 31st, 1949, is given in Table II. The total number liberated during this period was 449,373. Over 75 per cent of the predators were liberated in Sandys and Southampton Parishes as these contained the best remaining wooded areas.

The largest number of beetles liberated on one day was 35,000.

A list of the different species of predator from California which were introduced for **Carulaspis visci** during 1949 is given below:—

	Predator	*Date First Liberated*
1.	**Cybocephalus** sp.	August 1948
2.	**Microweisia suturalis** Schwartz	June 1949
3.	**Telsimia** sp.	February 1949
4.	**Zagloba ornata** Horn.	February 1947
5.	**Lotis nigerrima**	February 1949
6.	**Lotis neglecta** Muls.	February 1949
7.	**Pharoscymnus exiguus** Ws.	February 1949
8.	**Cephaloscymnus occidentalis**	November 1948
9.	**Lindorus lophanthae** (Blaisd.)	November 1947

The above species are all Coccinellids except **Cybocephalus** which is a Nitidulid.

Cybocephalus was originally introduced into California from Southeast China against red scale.

Telsimia was introduced into California from Southeast China where it feeds on purple scale.

Microweisia, Zagloba and **Cephaloscymnus** were found in California on Monterey Cypress trees infested with **Carulaspis visci.**

Lotis nigerrima, Lotis neglecta and **Pharoscymnus** originate from South Africa where they feed on red scale (**Aonidiella aurantii** Mask.) on citrus.

8. **RECOVERY OF PREDATORS:** Both larvae and adults of four of the eight recently introduced predators were recovered during the year on or near trees on which they had been liberated. **Telsimia** and **Lotis nigerrima** were recovered six months after liberation. **Cybocephalus** and **Microweisia** were each recovered on one occasion three months after liberation. **Telsimia** was the only beetle which was recovered on several liberation sites, and it is so far the most promising of these four predators. Insufficient recoveries have yet been made to state that any of them are definitely established on **Diaspis visci.**

LEPIDOSAPHES NEWSTEADI ON CEDARS

The Oyster-shell scale, **Lepidosaphes newsteadi** Sulc., was probably introduced prior to 1942 and was first discovered in Bermuda on cedars at Harrington Sound in 1944. The scale spread and increased rapidly during 1945 and 1946. Thousands of trees had been killed by the end of 1947. During 1947 and 1948, however, the intensity of the **Lepidosaphes** infestation decreased and the distribution of the scale remained confined to the east end of the Island. It was actually very difficult to find oyster-shell scales during the latter half of 1948 and no further damage occurred.

Lepidosaphes newsteadi was even more difficult to find during 1949. It became, in fact, very scarce in the east end of the Island. Two isolated infestations were found, one in Warwick where one tree was heavily infested and one in Somerset.

Oyster-shell scales were examined on cedar foliage from Warwick Parish. **Lindorus** had eaten 28 per cent of the scales, probably because they were scattered among **Carulaspis visci**. A number of dead scales were filled with yellow spheres, which were undoubtedly the sporangia of the Chytrid fungus, **Myiophagus ucrainica** (Wize) Sparrow, which was identified by J. S. Karling (Amer. Jour. Bot., 35: 3, 1948). Zoospores were observed when a scale containing sporangia was placed in water. This Chytrid may well be the main factor controlling **Lepidosaphes newsteadi.**

Predaceous mites and parasites which were introduced by the Commonwealth Bureau of Biological Control against the oyster-shell scale are discussed below.

1. **LIBERATION OF PREDACEOUS MITES:** Three shipment boxes of the migratory form of the predaceous mite, **Hemisarcoptes malus** Shimer, were received from Mr. W. F. Sellers in California in February and March. These mites were shipped on 235 Cocconellid beetles (mostly Chilocorus spp.) which were liberated with the mites on their bodies. **Lepidosaphes** scales were present on the cedar trees on which they were liberated.

Hemisarcoptes has not yet been recovered on cedar trees, but in January 1949 it was found feeding on the eggs of **Lepidosaphes beckii** on a lemon tree.

2. **LIBERATION OF PARASITES:** Four boxes containing foliage of **Pinus silvestris,** which was heavily infested by **Lepidosaphes newsteadi** and **Leucaspis loewi,** were received from Dr. L. P. Mesnil in Switzerland. Apart from the parasites, a large variety of other insects belonging to several different orders emerged from the material, which was kept in emergence boxes in the quarantine room.

The parasites were liberated during March and April in the Tucker's Town area and in Warwick, where **Lepidosaphes** was present on the cedar trees. Some **Aphytis mytilaspidis** and **Azotus** sp. were liberated in Paget in an area where **Carulaspis visci** was abundant. The parasites liberated were as follows:—

Prospaltella aurantii How	1,048
Aphytis mytilaspidis Le Bar	571
Azotus sp.	289
TOTAL PARASITES LIBERATED:	1,908

MINOR INVESTIGATIONS

Weed Killer for Onions

The final results of experiments with the weed killer "Aero Cyanate" for controlling weeds in onions and Easter lilies were very promising.

Good results were obtained in the onion and seed beds.

The control of weeds in field plantings of both onions and Easter lilies were excellent. Damage to the plants themselves was insignificant. The small difference between the average weight of the onions from two sprayed blocks was not significantly different to the results from two unsprayed blocks. Onions which were sprayed from the top instead of from between the rows did not suffer much more damage to the leaves.

The Easter lilies which were sprayed produced perfect flowers. Easter lilies which were sprayed from the top instead of from between the rows showed some injury to the leaves, but this was not serious.

BIOLOGICAL CONTROL OF SOFT SCALES AND MEALY BUGS

A total of 255 live specimens of the ladybird **Chilocorus angolensis** Crotch. was received from California during September. These were liberated on a banyan tree and on a citrus tree which were heavily infested with soft scales.

C. angolensis was originally obtained from South Africa where it is predaceous on the soft brown scale, **Coccus hesperidum** Linn.

INSPECTION SERVICES

JAPANESE BEETLE QUARANTINE: The usual precautions were taken to prevent the dreaded Japanese Beetle **Popillia Japonica** Newm. from becoming established on the Island. Japanese Beetle traps were set up around four strategic areas on June 1st and removed after the end of September. No Japanese Beetles were captured in these traps.

During the season from June to October, a total of 26 Japanese Beetles (6 alive and 20 dead) were intercepted in Bermuda. Nine dead beetles were found on the "Queen of Bermuda" at Hamilton Docks. A total of 6 live and 6 dead Japanese Beetles were found in planes arriving at Kindley Field Airport during June and July, while five dead beetles were found in a plane during November. No beetles were intercepted at the American Naval Operating Base.

INSPECTION OF PLANT IMPORTATIONS

The Plant Pathologist inspected and passed 104 parcels and large consignments of imported ornamental plants, bulbs, etc. One shipment of 2,100 Christmas trees and several smaller shipments were inspected. Four parcels of bulbs for export were inspected.

The following consignments imported contrary to Bermuda Bye-Laws were intercepted and destroyed: Daffodil bulbs (2), Bananas (3), plants in soil (3), Sweet Potatoes (3) and Corn Cobs (1).

A total of 44 parcels from the West Indies were inspected. Most of them contained some "tea leaves" (a mixture of leaves from various shrubs) which were confiscated.

About 22 barrels of fruit and vegetables from the West Indies were inspected. Among the contents of these were corn cobs, sweet potatoes and bananas which were confiscated. Yams which were heavily infested with the yam scale **Aspidiella hartii** (Ckll.), and the citrus mealy bug, **Pseudococcus citri** (Risso), were fumigated.

Two citrus budlings from the West Indies were destroyed as they were heavily infested with two species of scales, **Parlatoria zizyphus** (Lucas) and **Chrysomphalus ficus** Ash.

A caterpillar (unidentified) was found on bulbs which were confiscated.

Insects and mites which were intercepted and identified during 1949 are recorded below:

LIST OF INSECTS AND MITES INTERCEPTED

* Denotes a new record

***NOTOGONIDEA SP. (Sphegidae).** Reared from pupae intercepted in soil from the West Indies. —Det. Com. Inst. Entomology.

RHIZOGLYPHUS ECHINOPUS Fum. & Rob. The bulb mite, was intercepted destroying Tulip bulbs from England (7: 11: 49). —Det. Com. Inst. Entomology.

VINSONIA STELLIFERA Westw. The "Glassy Star Scale" was intercepted on orchids from the West Indies. It has previously been intercepted on palms from the West Indies in 1924 and 1926.

INSECTS AND MITES RECORDED

Arranged according to Host Plants. * Denotes a new record

ALLIUM CEPA L., Onion: The onion thrips, **Thrips tabaci** Lind., was common on onions at the Agricultural Station before they were sprayed with DDT. Numerous adults and larvae of the thrips were found on experimental unsprayed onions.

ARAUCARIA ROBUSTA Norfolk Island Pine. Norfolk Island Pine trees in Pembroke, Paget and Somerset were found to be infested with a mealy bug, **Eriococcus araucariae** Mask.— (Det. Com. Inst. Entomology). No parasites were found. These trees seem to withstand a heavy infestation of this insect. **Eriococcus** was intercepted in the U.S.A. on Araucarias imported from Bermuda in 1933.

BRASSICA OLERACEA L., var., Capitata. Cabbage. ***Chrysomela polita L.** (Chrysomelidae) was found on a cabbage in Pembroke (14: III: 49). —Det. Com. Inst. Entomology.

BRASSICA OLERACEA L., Cabbage, Cauliflower and Mustard. ***Murgantia histrionica** Hahn., the "fire-bug" or harlequin bug, has been noticed by Officers of the Agricultural Station during the last few years. It appears to have increased and become widespread during 1949 and specimens were brought in by the public throughout the year.— Det. Com. Inst. Entomology.

The harlequin bug is a pest on cabbage and related plants in the southern U.S.A.

A heavy infestation of this insect was seen at "Fruit-lands," Warwick on November 16th. Adult bugs were numerous on mustard plants and on watercress. This infestation undoubtedly originated from a patch of green glaze cabbage which were a year old and on which numerous adults and nymphs of all sizes were present.

Both Liquid Agrocide No. 3 (Gammexane spray) and Agrocide No. 3 (Gammexane dust) gave a 100 per cent kill 90 hours after treating adult Harlequin bugs in the laboratory. A 25 per cent DDT spray was ineffective.

CITRUS LIMON (L) BURN., Lemon. On January 26th, 1949, the predaceous mite, ***Hemisarcoptes malus** Shimer (Hemisarcoptidae) was found feeding on the eggs of the purple scale, **Lepidosaphes beckii** Newm., on a lemon from Mr. H. St. George Butterfield's orchard in Southampton. The Commonwealth Bureau of Biological Control introduced this mite in 1946 and liberated it on cedar trees infested with **Lepidosaphes newsteadi.** The mite is therefore established on citrus but it has not been recovered on cedar trees.— Det. Com. Inst. Entomology.

HIBISCUS ROSA — SINENSIS L., Hisbiscus. A scale was found at the Agricultural Station in September 1948 on two Hibiscus bushes which were very heavily infested. The lower branches appeared white due to the white covering of the male scales. The scale has subsequently been identified as ***Pinnaspis strachani** (Cooley). —Det. Com. Inst. Entomology.

JUNIPERUS BERMUDIANA L., Bermuda Cedar.

Ormenis infuscata Stal., Cedar Hopper. This pest made its annual re-appearance in March. The writer saw the first numph in the field on March 12th. The first adult hopper was seen on April 20th. During the latter half of April, numerous small nymphs were found in the evenings all over the trunks of cedar trees at "Ruskin," Devonshire. The hopper infestation during the year seemed normal.

NERIUM OLEANDER L., Oleander. In January, the branches of a portion of an Oleander hedge in Devonshire were being killed by the Oleander scale, **Aulacaspis pentagona** Targ. The percentage of parasitism by **Aphelinus diaspidis** was very low. Three females of the mite ***Pediculoides ventricosus** Newp. which is predacious on the pupae of the parasite, were found, but it did not seem to be responsible for the low parasitism as most of the pupae of the parasite were healthy. **Pediculoides** was previously found with the same scale in 1948 at "Cambridge Beaches," Somerset.

SABAL BERMUDANA L. H. Bailey, Bermuda Palmetto. ***Tyroglyphus castellanii** Hirst. (Tyroglyphidae), was found under the Palmetto scale, **Comstockiella sabalis** (Comst.) in Paget (18: III: 49). This mite appeared to be predaceous on the scale. —Det. Com. Inst. Entomology.

ADVISORY WORK

Fifty-two properties were visited in order to attend to 39 requests to inspect cedar trees and 13 requests to inspect pests or diseases on oleanders and other plants. Predators for **Carulaspis visci** were liberated on cedar trees in most of the properties.

A display of **Lindorus** was presented on five occasions at various fairs, meetings, etc., as part of a programme to acquaint the public with the biological control project directed against **Carulaspis visci.**

NEW LABORATORY

Most laboratory work from May 10th, 1948 to July 11th, 1949, was conducted in temporary quarters at "Cardiff Cottage" located next to the Princess Hotel. Office work was done at the Agricultural Station until March 14th, 1949, when alterations to the office building commenced.

An excellent new laboratory with proper quarantine facilities was built and completed on July 11th, 1949. Apparatus and fittings for immediate requirements were installed.

VISIT TO CALIFORNIA

The writer made an official visit to California from June 13th to 30th. The main purpose of the visit was to study the methods used in mass-rearing beneficial insects, particularly those being reared by Mr. Wendell Sellers at the Fontana Laboratory, for liberation against **Carulaspis visci** in Bermuda. The university of California was visited at Riverside, Berkeley and Albany. A special report on this visit was submitted.

ASSISTANTS

In order to carry out the project of mass-rearing predators in Bermuda for liberation against **Carulaspis visci,** it was necessary to employ several assistants. All rendered very satisfactory and valuable service.

Mr. Fred Bennett, a student entomologist, was sent from Canada by Dr. W. R. Thompson. He remained from May 2nd to August 31st. Mr. Winton Williams assisted from May 30th to September 14th. Mr. Gerald Young Jr., was employed from July 3rd to August 19th. Assistants who commenced work in August or September were as follows: Mr. Michael Darling, Mrs. J. B. Ferguson, Mr. Gerald Paley and Miss Anne Wyatt.

ACKNOWLEDGMENTS

Thanks are due to the Commonwealth Bureau of Biological Control for the excellent condition of shipments of parasites and predators for the Juniper scale and the Oyster-shell scale.

The writer wishes to express his thanks to Mr. Wendell F. Sellers, Prof. Harry S. Smith, Dr. Stanley E. Flanders, Mr. Harold Compere, Dr. Paul de Bach, Mr. Glenn L. Finney and others for their kind assistance on his visit to California.

Acknowledgment is made to the Commonwealth Institute of Entomology for the identification of insects.

VISITORS

A general survey of the cedar trees was again made with Dr. W. R. Thompson, Director of the Commonwealth Bureau of Biological Control, who visited Bermuda from December 3rd to 11th, accompanied by Mrs. W. R. Thompson.

Visitors to the laboratory during the year were as follows:— His Excellency the Governor, General Sir Alexander Hood; Mr. C. C. Hartney of Tree Surgeons, Inc., Mass; Major S. H. Short, Plant Protection Division, Department of Agriculture, Canada; and Dr. Lindley G. Cook, Associate Director of New Jersey Agricultural College Experiment Station.

Respectfully submitted,

E. C. G. BEDFORD,

Plant Pathologist.

TABLE I

MONTHLY LIBERATIONS OF PREDATORS AGAINST CARULASPIS VISCI

January 1st to December 31st, 1949

Month	*Predators reared in California*	*Bermuda*	*Total*
January	535	—	535
February	3,598	—	3,598
March	—	—	—
April	—	—	—
May	13,673	—	13,673
June	159,680	—	159,680
July	42,813	—	42,813
August	33,445	1,521	34,966
September	31,108	3,659	34,767
October	14.485	36,155	50,640
November	2,457	29,734	32,191
December	15,763	64,880	80,643
	317,557	135,949	453,506

TABLE II

SUMMARY OF PREDATORS LIBERATED AGAINST CARULASPIS VISCI

From May 1st to December 31st, 1949

PARISH	*PREDATOR*									
	Cybo.	*Micro.*	*Tels.*	*Zag.*	*L. Nig.*	*L. Neg.*	*Pharo*	*Ceph.*	*Lind.*	*TOTAL*
Sandys	153,335	10,801	55,929	572	4,578	207	288	—	619	226,329
Southampton	24,179	41,215	50,571	12,502	6,331	59	—	1,735	166	136,758
Warwick	6,607	15,556	9,898	—	853	—	1,042	—	—	33,956
Paget	1,717	1,689	2,824	—	105	79	—	—	—	6,414
Pembroke	5,876	1,129	11,107	—	1,387	13	117	—	—	19,629
Devonshire	938	—	6,388	—	—	—	—	—	—	7,326
Smith's	1,647	—	1,226	—	13	—	—	—	—	2,886
Hamilton	1,998	—	1,860	—	—	—	—	—	—	3,858
St. George's	3,228	2,721	3,981	230	1,939	53	65	—	—	12,217
TOTAL:	199,525	73,111	143,784	13,304	15,206	411	1,512	1,735	785	449,373

Total predators reared in California — 313,424

Total predators reared in Bermuda — 135,949

449,373

Cybo. — **Cybocephalus** sp.
Micro. — **Microweisia** sp.
Tels. — **Telsimia** sp.
Zag. — **Zagloba ornata**
L. nig. — **Lotis nigerrima**

L. neg. — **Lotis neglecta**
Pharo. — **Pharoscymnus exiguus**
Ceph. — **Cephaloscymnus occidentalis**
Lind. — **Lindorus lophanthae**

REPORT OF THE GOVERNMENT VETERINARY OFFICER FOR 1949

To: The Director of Agriculture.

I have the honour to submit my Report for the year 1949.

In order that this report may be as clear as possible, each phase of my work as Government Veterinary Officer will be dealt with under its appropriate heading and as concisely as possible.

TUBERCULOSIS CONTROL

The Board and Department's plan to control Tuberculosis in cattle is by bi-annual testing of all cattle in these Islands, the slaughter under inspection of those animals which react with the payment of compensation to the owners of condemned animals and the quarantine of premises where reactors are found until three clear tests of 60 to 90 day intervals have been passed. However, the 1948 second test was so close to the end of the year that it was impossible to do the 1949 test until June. It then became apparent that this time of the year was too hot both for cows and testers and since the result was so favourable it was decided to omit the second test for 1949 and do the tests for 1950 in March and April October and November.

During 1949, 1,275 cattle were subjected to the Intra-dermal tuberculin test, the standard test for tuberculosis in these Islands, and there were no reactors.

Earlier in the year a **suspicious** heifer from 1948 was checked with the subcutaneous or temperature method and reacted, was condemned and slaughtered in post mortem **no** lesions were found, this being only the second non-visual lesion reactor I have seen since I have been attached to the Department.

Four other cows were retested toward the end of the year at the owner's request as they were drinking raw milk.

As an example of how my staff work and the general good co-operation of the cattle owners, on July 21st, 1949, 275 cows were examined in Smith's Parish before 9 a.m.

The only other signs of tuberculosis in cattle were two cases seen on examination of carcasses in the slaughter houses. One was an aged cow, a carry over from the once heavily infected Princess herd and the other, a cow carried over from the herd of Ferris which was almost wiped out some years ago by Tuberculosis. Both cases were old lesions and these cows had failed to react to previous tests.

BRUCELLOSIS (BANG'S DISEASE) CONTROL

The policy followed in this instance is that of calf-hood vaccination, that is, all calves that are to be raised are vaccinated with strain 19 Brucella abortus vaccine between the ages of four to eight months and are bled between sixty to ninety days after vaccination to determine whether or not the vaccination has been successful. If not successful, the calf is revaccinated and bled in a further sixty to ninety days.

In addition, any private owner of a cow may, on request, when the animal is being tested for tuberculosis, have its blood tested in order to determine whether or not is is positive and might possibly transmit Undulant Fever in its milk.

During 1949, 105 calves were vaccinated plus the 60 carried over at the end of 1948, thus there are approximately 164 calves being raised at the present time, plus an undetermined number under six months of age.

Only seven persons requested that their private cows be blood tested. Of these one milking cow reacted and one vaccinated heifer showed that she was successfully vaccinated.

HOG CHOLERA CONTROL

This control consists of the animal inoculation of all hogs in the Island with anti-hog cholera serum during the spring months and other inoculations with the same material when an outbreak occurs or is suspected of occurring.

Eleven hundred and thirty-eight hogs were inoculated during 1949. Of this number, 10 were vaccinated prior to export to Antigua.

Only the larger herds and individual hogs on congested areas were done as a precaution. It being impossible for one person to do all single hogs as well and continue with other Government work.

On eight occasions reports were made that hogs had cholera but to our relief on not one occasion during 1949 was cholera known to exist.

MEAT INSPECTION

This phase of my activity comes under the direction of the Department of Public Health. The information gathered during the routine inspection of all carcasses coming into the abbatoirs for slaughter gives a very excellent idea of the efficacy of the various tests and control methods.

The various classes of livestock slaughtered and the amount month by month is listed below:—

Month	*Cows*	*Bulls*	*Steers*	*Calves*	*Hogs*	*Sows*	*Goats*
January	15	—	—	33	115	18	—
February	14	2	—	37	103	15	—
March	18	1	—	36	138	27	—
April	21	2	—	44	195	37	—
May	26	3	—	47	165	35	1
June	17	1	1	28	112	18	—
July	13	1	—	30	72	16	—
August	11	1	—	31	65	14	—
September	6	—	—	27	84	9	—
October	5	—	—	26	78	10	—
November	6	—	—	27	110	18	—
December	8	—	—	36	347	32	—
TOTAL:	160	11	1	402	1,584	249	1

Grand Total: 2,408 carcasses — a drop of 570 carcasses below 1948, due to the importation of meat from Australia.

Out of all the carcases examined the following condemnations were made:—

Major Portions:— One whole hog — sunstroke.
One cow — Mastitis and metritis.
One fore-quarter of a cow due to T.B.
One fore-quarter of a cow due to broken leg and bruising.

Minor portions:— 39 portions due to inflamatory changes accompanying a previous attack of pneumonia.
6 livers due to fibrosis.
2 livers due to abcessation.
1 liver due to fatty degeneration.
1 hog belly due to localized abcessation.
4 hog heads due to abcess.
2 hog heads due to bruising.
3 hog heads due to T.B.
1 cow heart due to pericarditis.
2 cow plucks due to T.B.
1 hog kidney due to cystic degeneration.

This work was carried out in 321 visits to the slaughter houses.

Pearman, Watlington and Co. Ltd., ceased general killing as of July 1st, 1949 and as the Health Department did not revoke their licence, they occasionally kill a calf from a member of the firm.

ARTIFICIAL INSEMINATION

Some impetus was given to this by Sir Howard Trott, who during a trip to the United States had occasion to see such a plan in action. His recommendations to the Board were considered and may be tried in the coming year.

ANIMALS ADMITTED

Only animals carrying adequate certificates of health from a proper authority in their country of origin are admitted. In the case of Steamships I, personally, meet all those carrying animals; while in the case of Aeroplanes, the Inspectors of the Department of Public Health collect the certificates if they are in order and if not the animals are detained until I can be contacted.

The plea made yearly for an adequate Quarantine Station continues to go unheeded. This year, I have had monkeys, macaws, cats, parrots and cattle to be quarantined and have had to use such makeshift arrangements as it was possible at the Station. This is not satisfactory, as it is not isolated and a great many people pass through it each day. Due to the fact that I did not have adequate stables it was necessary to let imported race horses go to the track immediately despite the proper Health Certificates and on two occasions influenza broke out.

The following animals were admitted in 1949:—

Horses	— 23
Cattle	— 34
Donkeys	— 6
Goats	— 14
Sheep	— 2
Dogs	—128
Cats	— 9
Baby Chicks	—305 cartons
Chickens	— 5
Turkey poults	— 3 cartons
Pigeons	— 12
Parrots and/or Macaws	— 11
Ducks	— 2 cartons and 2 individuals
Gold Finches	— 13
Rabbits	— 3
Live Frogs	— 3 boxes—K.E.M.H.
Skunk	— 1 (deodorized)
Alligators	— 3 (1 dead on arrival).
Gold Fish	— 1 jar

Assorted Birds and Animals — 9 boxes for the Aquarium

DAIRY INSPECTION

Dairy Inspection was not carried out in 1949 to the extent that it had been in 1947 and 1948, but all dairies were seen at least twice and all help was given to the Milk Inspector that was possible.

IMPROVEMENT OF LIVESTOCK

At the beginning of 1949 the four Government owned Bulls were out on loan to Dairy farmers to aid in the improvement of their stock. During the summer, however, "Oakfield Buddy" was in an unfortunate accident and died of strangulation.

Under the Department's new plan of paying 75 per cent of the cost of a good bull while the purchaser pays the balance and has full ownership, two (2) new bulls were brought in during this year.

POLICE CASES AND CALLS

On one occasion I had to attend the Supreme Court in a case against a young boy, which was thrown out due to the mentality of the defendant.

Three appearances were made in police court in regards to cruelty to a bull and two horses.

Six horses, the carcass of one heifer, one goat and some pigeons were also examined at the request of the police.

CERTIFICATES ISSUED

Thirty-nine (39) certificates of health were issued for outgoing animals and four (4) Race Horses were subjected to the Mallein test prior to their return to the U.S.A.

OTHER DISEASES

As far as hogs are concerned there was one outbreak of Swine Erysepalous on the farm of A. J. Terceira during 1949 as compared with two in 1948. As in the year previously all hogs on the farm were treated with Anti-Swine Erysepalous serum and there were no fatalities.

It seems peculiar that on two successive years this has appeared on this farm and at no other place except one isolated case in Middletown in 1947. It has not been observed in these Islands since 1944 when I returned from Canada and became attached to this Department other than stated above.

Mastitis in cattle has continued to be a very grave danger to the milk industry. It is very widespread in the larger dairy herds and I feel some very definite and concentrated action must be taken as soon as possible. This is probably one of the most difficult diseases to control and almost impossible to erradicate.

While the latest methods of treatment namely penicillin wicks do a remarkable job in stemming many virulent infections and are a product that can be used by the average dairyman, yet unless one is able to get a correct laboratory diagnosis of the offending organisms in any herd and to instill into the minds of the milkers that stripping prior to milking with the careful examination of each quarter of the udder, strict cleanliness and carefulness in the handling of each and every infected cow and the prompt attention to the first signs of unusual milk with adequate treatment, very little will be accomplished. The more widespread use of milking machines in these Islands in the hands of persons whose idea of cleanliness and sterilization are nil or minus and who will put a machine on one

cow to start milk and continue throughout the herd without checking each cow and dipping the teat cups in a chlorine solution between cows, has tended to spread the disease. From personal observations I have found that unless the milk is so bad that it will not go through the strainer in five minutes or more or cannot be shaken through then it is considered alright.

Until laboratory facilities are available and it is possible to get a good fourth year student from a Veterinary College to work in the laboratory during four or five months, there is little one can do but advise cleanliness, etc.

In chickens, as far as my records show, there was only one outbreak of cholera in 1949, and it was only by being called in on consultation by a private practitioner that I was made aware of this condition.

Again in cattle there was an outbreak of Infectious diarrhea in the herd of Manuel da Costa of Paget, which with some alleviating medication wore off with no fatal results.

On one occasion during the year it was reported that two mangy dogs were roaming the countryside and a menace to all other dogs. I was able to check with the private practitioner concerned and learned that the worst dog had been destroyed and the other which was responding to treatment was secured and not roaming.

On two occasions there were outbreaks of Influenza in the horses at Shelly Bay Race Track. All horses admitted had their health certificates in order on arrival but had apparently contacted the germ in sales stables or while travelling. Fortunately, this was confined to the Race Track and did not spread to other local horses. This again brings out the fact that a suitable Quarantine Station is needed where such animals can be detained in comfort until the danger period passes. All the horses at the Track were treated on both occasions by suitable anti-bacterial anti-serum.

On one occasion a shipment of bulls travelling through these Islands had an outbreak of Shipping Fever but prompt notification by the Steamship agents and correct medication appeared to control it and it was not experienced in local cattle.

OTHER ACTIVITIES

On one occasion I was called upon to address the general public over Z.B.M. and talked on the Regulations appertaining to animals entering these Islands, particular stress being laid on the reasons for their being in force.

During the year Mr. Shepherd, Executive Clerk of the Ontario Veterinary College, was in these Islands and after being shown around the Station, was taken on a tour of the eastern end of the Island.

Considerable trouble has occurred in the high producing cows imported in the last two years on the matter of conception. Cystic ovaries have been very prevalent as well as other ovarian and uterine troubles. Toward the end of the year we were table to obtain the latest products which, according to current Veterinary publications, are useful in such cases and have experimented with them. As yet it is too soon to enumerate the results. Personally, I feel that the change of climate with a long hot period, no real cold season and poor pasteurage have considerable to do with this condition in imported cattle.

On nine occasions I was called upon to shoot horses involved in accidents and other causes.

During the year I was called upon to answer sixty-nine (69) emergency calls. These varied from Dystokia in cattle to colic in horses. A considerable number of these calls were during the month that one veterinary practitioner was away on holiday and the other was ill.

APPRECIATION

As in previous years the great majority of livestock owners have been most co-operative and appreciative.

The S.P.C.A. have graciously continued to allow their Inspector to Assist in cattle testing and hog inoculation.

Respectfully submitted,

EDWARD R. EARL,

Government Veterinary Officer.

APPENDIX "A"

SUMMARY OF RECEIPTS FOR YEAR 1949

Vote 2 (a)	Packing House	£ 689 0 0		
2 (b)	Marketing Centre	13,969 19 4		
2 (c)	Canning Plant	Nil		
2 (d)	Service to Citrus Growers ..	443 18 6		
2 (e)	Other Receipts	3,748 15 8		
			£18,851	13 6

The following is a breakdown of the above:—

Vote 2 (a)	Sale of crates, etc.	689 0 0	
2 (b)	Sale of Vegetables at Marketing Centre	13,969 19 4	
2 (c)	Canning Plant	Nil	
2 (d)	Service to Citrus Growers ..	443 18 6	
2 (e)	Hire of Equipment	662 8 2	
	Sale of Plants	1,194 11 3	
	Sale of Citrus	865 14 6	
	Sale of Fertilizer	36 7 6	
	Sale of Avocados	29 16 0	
	Sale of Livestock	122 0 0	
	Stock Service	4 18 0	
	Reafforestation work..	578 19 0	
	Miscellaneous	254 1 3	
MEMO:	(Reimbursements — £235 9 2).		
	(Suspense Account — Portuguese Labour — £960 0s 0d)		£18,851 13 6

APPENDIX "B"

EXPENDITURE FOR PERIOD JANUARY 1st to DECEMBER 31st, 1949

Vote:	*Service*:	*Amt. of Vote*:	*Expd.*:	*Bal. Lapsing*:
1	Fees to Members of Board	100 0 0	72 8 0	27 12 0
2-8, 10, 12, 13, 15 & 17	Salaries	8,686 0 0	7,271 15 2	1,414 4 10
3A	Personal Allowance to E. C. G. Bedford	300 0 0	300 0 0	Nil
9, 14, 16, 18, 19	Bonus	760 0 0	190 19 10	569 0 2
11	Trav. Allow. to G.V.O ..	75 0 0	18 15 0	56 5 0
16A	Asst. Markt. Officer ..	505 0 0	Nil	505 0 0
19A	Extra Clerical Asstnce. ..	500 0 0	482 16 2	17 3 10
20	General Grant	3,500 0 0	3,241 19 7	258 0 5
21	Control of Animal Diseases and Improv. of Livestock	1,750 0 0	1,740 2 10	9 17 2
22	Control of Plant Diseases and Pests	500 0 0	465 11 1	34 8 11
23	Horticulture	2,500 0 0	2,448 5 9	51 14 3
24	Govt. House Gardens ..	2,100 0 0	2,096 2 7	3 17 5
25	Dept. Contgs., etc.	250 0 0	247 0 3	2 19 9
26	Packing House and Market Investigations	1,000 0 0	999 15 9	4 3
27	Canning Plant	2,000 0 0	70 2 1	1,929 17 11
28	Cold Storage Plant Oper.	2,850 0 0	1,526 3 0	1,323 17 0
29	Purchase, Upkeep and Oper. of Agric. Equip. ..	3,900 0 0	3,899 14 6	5 6
30	Purchase and Storage of Agricultural Supplies ..	500 0 0	483 12 1	16 7 11
	Potatoes, etc. for resale..	18,000 0 0	16,585 5 2	1,414 14 10
31	Purchase and Storage of			
32	Agricultural Scholarships	500 0 0	93 1 3	406 18 9
33	Agricultural Exhibition ..	750 0 0	339 18 9	410 1 3
34	Biological Control of Insects of imp. in Bda. ..	10,000 0 0	8,534 16 2	1,465 3 10
35	Reafforestation and roadside Planting	23,500 0 0	21,346 5 3	2,153 14 9
36	Service to Citrus Growers	1,200 0 0	1,199 19 1	11
37	Publications	250 0 0	32 3 10	217 16 2
		£85,976 0 0	73,686 13 2	12,289 6 10

APPENDIX "C"

GOVERNMENT WHOLESALE MARKETING CENTRE
PROFIT AND LOSS STATEMENT FOR YEAR 1949

To Stock, January 1st, 1949	32 10 0		By Sales	14,618 11 1	
,, Purchases	14,337 11 6		By Stock, Dec. 31st,/49	437 9 10	
,, Gross Profit	685 19 5				
	15,056 0 11			15,056 0 11	
To Transfer to Treasury Account	15,624 10 0		By Gross Profit B/D	685 19 5	
			By Cold Storage Sales	600 19 1	
				1,286 18 6	
			By Government Grant	14,337 11 6	
	15,624 10 0			15,624 10 0	

ACKNOWLEDGMENT

I wish to gratefully acknowledge the assistance afforded me by the members of the Board of Agriculture during a very strenuous year.

The assistance afforded the Department by the Commonwealth Bureau of Biological Control under the personal direction of Dr. W. R. Thompson was of the greatest benefit.

To the many institutions and individuals who assisted the Department in many ways I wish to record my grateful thanks.

Respectfully submitted,

W. R. EVANS,

Director of Agriculture.